

SUPPORT FOR THE AMENDMENTS

Claims 29, 34, 36, 38 and 39 have been amended to replace “hydrophilic and/or photocatalytic” with --photocatalytic--. Accordingly, no new matter is believed to have been added to the present application by the amendments submitted above.

REMARKS

Claims 25-30, 34-39 and 44-45 are pending. Favorable reconsideration is respectfully requested.

An important aspect of the present invention is that the substrate has a photocatalytic coating containing titanium oxide in the anatase form. See independent Claims 25-29, 34, 36-39 and 44. As described in the specification, photocatalytic means that the titanium oxide coating is capable of oxidizing organic materials accumulated on the coating surface when exposed to radiation, such as sunlight. Therefore, in the present invention, accumulated organic matter on the exposed surface of the coated substrate is oxidized by the titanium oxide coating resulting in a self-cleaning effect. See the present specification at page 1, line 39 to page 2, line 9.

1. Claims 25-27, 29-30, and 34-36 Are Not Unpatentable Under 35 U.S.C. §102(e) Over Vandiest (U.S. patent No. 5,721,054).

Applicants submit herewith an executed Rule 132 Declaration from Dr. Bernard Nghiêm. In that Declaration, Dr. Nghiêm discusses that procedure for depositing titanium oxide coatings. See the top of page 2 of the Declaration. Dr. Nghiêm states:

After closely examining the deposition procedure described by Vandiest, I believe that, while the conditions given by Vandiest can work well with a mixture of tin tetrachloride and water, this is not the case for titanium tetrachloride and water. On the basis of experiments I performed, I can confirm that for the deposition of titania, the use of the TiCl_4 and water ends up creating a nanoparticle powder and does not form a homogeneous coating on the substrate surface. [See page 2 of the Declaration.]

Dr. Nghiêm points out attempting to deposit titanium dioxide under the conditions described by Vandiest produces the well-known result of creating powder as had been used in fluid

flows to study the hydrodynamics of the flow (see the bottom of page 2 and the top of page 3 of the Declaration).

Beginning at the bottom of page 3 of the Declaration, Dr. Nghiêm describes the deposition procedures as described in patents referred to by Vandiest in the specification of the patent. Dr. Nghiêm states

If such a configuration (in figure 3) is used with water and titanium tetrachloride, at the intersection region between the 2 flows from the 2 nozzles, nano powder is formed instead of a coating. [Declaration page 3, last sentence.]

So if this kind of tool is used with TiCl_4 and water instead of SiH_4 and O_2 , nano power is formed before arriving on the substrate surface. [Declaration page 4, last sentence.]

Beginning at page 6 of the Declaration, Dr. Nghiêm describes experiments that were conducted in order to reproduce the conditions of the deposition and the tool for the gas injection mentioned by Vandiest and FR2648453. Dr. Nghiêm summarizes the results of the experiments at the top of page 9, stating:

With the preceding deposition parameters, we could not deposit any real coating. Instead, we have produced powder, part of which weakly adheres to the surface of the substrate when the experiment was over. This powder can be easily wiped out by a tissue cloth.

Dr. Nghiêm concludes as follows:

The process parameters described by Vandiest for the deposition of large gap semi conductor like SnO_2 or TiO_2 , starting from Ti or Sn tetrachloride with water as oxidant are only valid for the deposition of SnO_2 . In the case of TiO_2 , our own experiments and several scientific sources have proven clearly that even at low temperature TiO_2 powder is formed when TiCl_4 and water is brought into contact, instead of an homogeneous coating on the surface. [Declaration at the middle of page 9.]

Thus, the Declaration of Dr. Nghiêm demonstrates that the method described in Example 1 of Vandiest does not produce a photocatalytic coating of titanium dioxide on a substrate.

Applicants previously submitted an executed Rule 132 Declaration of Dr. L  thicia Gu  neau (hereinafter referred to as "the Declaration") with the Request for Reconsideration on December 8, 2003. Dr. Gu  neau has eight years of experience in the field of physico chemistry/self-cleaning glass (see paragraphs (1) and (2) of the Declaration).

Dr. Gu  neau points out that in Example 2, Vandiest describes a glass substrate coated with a 41 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 45 nm (see paragraph (6) of the Declaration). In Example 3, Vandiest describes a glass substrate coated with a 85 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 46.5 nm (see paragraph (7) of the Declaration). According to Dr. Gu  neau, Fe, Co, and Cr oxides are well-known to be poisons for photocatalysts. Therefore, one of ordinary skill in the art would limit the contents of those metal oxides because of their known properties as photocatalyst poisons (see paragraph (8) of the Declaration).

At page 10, lines 3-9 of the Reply Brief, the Examiner asserts that the analysis provided by Dr. Gu  neau is contradicted by the specification of the present application and Kato. This is not the case. That this is so is demonstrated by Carneiro et al., Study of the Deposition Parameters and Fe-Dopant Effect in the Photocatalytic Activity of TiO₂ Films Prepared by dc Reactive Magnetron Sputtering, *Vacuum*, 78, 2005, pp. 37-46, a copy of which is submitted herewith. Carneiro et al. describe the effect of doping a photocatalytic coating of TiO₂ on a substrate with iron. At a low concentration of iron the layer has higher photocatalytic activity as compared to the undoped layer. In contrast, a highly-doped layer has strongly decreased photocatalytic activity. In view of the foregoing, Dr. Gu  neau's comments are not inconsistent with the specification of the present application and Kato.

In addition, in Examples 2 and 3, the TiO₂ layer is buried under the Fe-Co-Cr layer. For that reason, one would expect that accumulated organic matter could not be decomposed by the TiO₂ layer because it would never get to that layer. Therefore, such a layer is not photocatalytic as recited in the claims of the present application.

In view of the foregoing, Vandiest fails to describe the claimed coated substrate. Accordingly, withdrawal of this ground of rejection is respectfully requested.

2. Claims 25-27, 29-30, and 34-35, 39, and 44-45 Are Not Unpatentable Under 35 U.S.C. §102(e) Over Teowee (U.S. patent No. 5,604,626).

As discussed above, an important feature of the claimed substrate is that it has a photocatalytic titanium oxide coating, i.e., accumulated organic matter on the exposed surface of the coated substrate is oxidized by the titanium oxide coating.

Teowee et al. describe a photochromic device, which is a multi-layer structure that allows for the control of darkening when the device is exposed to radiation. See the Abstract and the Figures; see also paragraph (10) of the Declaration from Dr. Guéneau. The device may contain a radiation-sensitive electrode which is denoted as element 30 in the specification and the Figures of the reference, and may be composed of titanium oxide. See column 7, lines 27-28. As shown in Figures 1-3, the radiation-sensitive electrode is buried within the layer stack. In fact, the Figures show radiation-sensitive electrode 30 to be buried under three (Figure 2), four (Figure 1A, 1B and 4) or five layers (Figure 3). For that reason, one would expect that accumulated organic matter could not be decomposed by electrode (30) because it would never get to the electrode. Therefore, such a layer is not photocatalytic as recited in the claims of the present application. Accordingly, withdrawal of this ground of rejection is respectfully requested.

3. Claims 26-28 Are Not Unpatentable Under 35 U.S.C. §103(a) Over Kato (U.S. patent No. 6,284,314).

Dr. Guéneau notes that Kato is completely silent regarding the size of titanium oxide crystallites (see paragraph (15) of the Declaration). According to Dr. Guéneau, Kato also fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. See paragraph (18) of the Declaration.

According to Dr. Guéneau, the reference also fails to describe the contact angle or the root mean square (RMS) rugosity of the coating (see paragraph (16) of the Declaration). In Dr. Guéneau's opinion, Kato is completely silent with respect to the RMS rugosity of the coating and, therefore, fails to suggest a coating having a value between 2 and 20 nm. See paragraph (21) of the Declaration.

Dr. Guéneau also points out that Kato fails to explicitly disclose a layer which functions as a barrier to alkali metals originating from the substrate, and that the reference does not suggest that such a component would be desirable. See paragraph (19) of the Declaration. In addition, Dr. Guéneau points out that Kato describes the optional heating of solutions coated on substrates in the absence of a barrier layer to alkalis, such as sodium from the substrate. Quartz glass substrates are described, which consist of SiO₂, and do not contain alkalis. See paragraph (22) of the Declaration.

Claim 26 recites, *inter alia*, (1) a thin layer a thin layer forming a barrier to alkali metals originating from the substrate, which is located between the substrate and the coating, and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato does not identify a layer which functions as a barrier to alkali metals originating from the substrate, nor does the reference suggest that such a component would be desirable. Kato fails to suggest that the titanium crystallites have an

average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 26.

Claim 27 specifies, *inter alia*, (1) that the coating has contact angle with water below 5° after exposure to luminous rays and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato is completely silent with respect to the contact angle of the coating and, therefore, fails to suggest a coating having a value below 5° as claimed. In addition, Kato fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 27.

Claim 28 specified, *inter alia*, (1) that the coating has an RMS rugosity between 2 and 20 nm and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato is completely silent with respect to the RMS rugosity of the coating and, therefore, fails to suggest a coating having a value between 2 and 20 nm. In addition, Kato fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 28.

In view of the foregoing, Kato fails to describe the coated substrate specified in Claims 26-28. Withdrawal of this ground of rejection is respectfully requested.

4. Claim 39 Is Not Unpatentable Under 35 U.S.C. §103(a) Over Vandiest.

Claim 39 recites a windshield wherein at least the face of said windshield turned toward the inside of the passenger compartment is provided with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form.

As discussed above (see section (1)), Vandiest fails to described the photocatalytic coating of the present invention. In addition, as noted by Dr. Guéneau above, the purpose of the coating described in Vandiest is to have low solar factor and a high purity of reflected color (see column 2, lines 13-17 of the reference). Vandiest fails to describe that the coating described therein is photocatalytic or hydrophilic. In addition, as recognized by the Examiner, the glazing described by Vandiest is to be used for architectural buildings and not as a windshield. See paragraph (23) of the Declaration. In view of these differences, the reference fails to suggest the claimed windshield. Accordingly, withdrawal of this ground of rejection is respectfully requested.

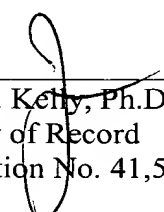
Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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